Algebra 1
Day 11 – Applications of the Vertex
Practice Assignment

Unit 8: Quadratic Functions
Name: **Key**
Date: _____ Block: _____

Practice

Review – Find the vertex of the following equation: $y = 2x^2 - 4x + 5.$
$\qquad\qquad\qquad\qquad\qquad\qquad A \quad B \quad C$

$$X = \frac{-b}{2a} = \frac{4}{2(2)} = \frac{4}{4} = 1$$

$$y = 2(1)^2 - 4(1) + 5 = 3$$

Vertex $(1, 3)$

Directions: Answer the following questions that pertain to using applications of the vertex.

1. The valley between two mountains whose peaks touch the x-axis is $y = 40.4x^2 - 404x$, where x and y are measured in feet. How deep is the valley?

$$X = \frac{-b}{2a} = \frac{404}{2(40.4)} = \frac{404}{80.8} = 5 \, ft$$

The valley is 1010 ft deep.

$$y = 40.4(5)^2 - 404(5)$$
$$y = -1010 \, ft$$

Vertex: $(5, -1010)$

2. A model for a company's revenue is $R = -15p^2 + 300p + 12{,}000$, where p is the price in dollars of the
$\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad A \qquad\quad B \qquad\quad C$
company's product. What price will maximize revenue? What will be the maximum revenue?

$$P = \frac{-b}{2a} = \frac{-300}{2(-15)} = \frac{-300}{-30} = \$10$$

The price of $10 will maximize the revenue to $13,500.

$$R = -15(10)^2 + 300(10) + 12{,}000$$

$$R = \$13{,}500$$

3. The photo shows the Verranzo-Narrows Bridge in New York, which has the longest span of any suspension bridge in the United States. A suspension of cable of the bridge forms a curve that resembles a parabola. The curve can be modeled with the function **$y = 0.0001432(x - 2130)^2$**, where x and y are measured in feet. The origin of the function's graph is at the base of one of the two towers that support the cable.
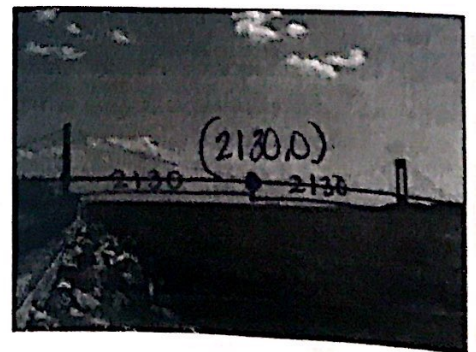
a. What is the vertex of the bridge between two towers?

$$(2130, 0)$$

$(2130, 0)$

b. How far apart are the towers?

midway is 2130 ft, so $2130 + 2130 =$

$$4{,}260 \, ft \, apart$$

4. A missile is launched along a path determined by the equation $f(x) = -2x^2 + 72x$, where $f(x)$ is the height of the missile in feet x seconds after the launch. A plane is flying nearby at a height of 650 feet. Is the plane in danger? Why or why not?

$$X = \frac{-b}{2a} = \frac{-72}{2(-2)} = \frac{-72}{-4} = 18 \text{ seconds}$$

$$y = -2(18)^2 + 72(18)$$

$$y = 648 \text{ ft}$$

No, the plane is not in danger because the highest the missile reaches is 648 ft and the plane is 650 ft.

5. A model rocket is launched straight upward. The path of the rocket is modeled by $h = -16t^2 + 200t$, where h represents the height of the rocket and t represents the time in seconds.

a. What is its maximum height?

$$t = \frac{-b}{2a} = \frac{-200}{2(-16)} = \frac{-200}{-32} = 6.25 \text{ seconds}$$

$$h = -16(6.25)^2 + 200(6.25)$$

$$h = 625 \text{ ft}$$

The max height is 625 ft.

b. Is it still in the air after 8 seconds? Explain why or why not.

$$h = -16(8)^2 + 200(8)$$

$$h = 576 \text{ ft}$$

Yes, at 8 seconds, the rocket is 576 ft high.

c. Is it still in the air after 14 seconds? Explain why or why not.

$$h = -16(14)^2 + 200(14)$$

$$h = -336 \text{ ft}$$

No, at 14 seconds, the rocket is on the ground since the height is negative.